

## CLAIMS

1. An iterative decoding and equalizing device for high bit rate communication over frequency-selective channels with multiple transmit and receive antennas, said device  
5 comprising a decision feedback equalizer adapted to receive data from different receive antennas and including a forward filter (9) and a recursive backward filter (12) fed with calculated weighted reconstituted data from the output of a decoder (13) fed by decision  
10 means (11) and said device further including means (10) for subtracting the output of said backward filter (12) from the output data of the forward filter (9), whereby the subtracted data is fed to the input of the decision means (11) with the output of the decoder (13) and the  
15 decision means (11) produce a statistic which is forwarded to a channel decoder with weighted inputs and outputs and said decision means (11) take into account the space noise correlation at the output of the subtraction means (10) and the decision means (11) and  
20 the decoder (13) are separated by space-time interleaving at a binary level, which device is characterized in that the forward filter (9) and the backward filter (12) are iteratively adapted to minimize the mean square error at the output of the subtractor (10).

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2. A device according to claim 1, characterized in that the decision means (11) at the output of the subtraction means (10) of the equalizer are of the space whitening type and followed by a sphere decoder.

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3. A device according to claim 1, characterized in that the decision means (11) at the output of the subtraction means (10) of the equalizer are of the serial and/or parallel type (SIC/PIC) adapted to cancel residual space  
35 interference at the output of the subtraction means (10) of the equalizer.

4. A device according to any preceding claim, characterized in that the space whitening is effected at the output of the subtraction means (10) of the equalizer.
5. A device according to claim 4, characterized in that the space whitening is effected by the decision means (11).
- 10 6. A device according to claim 2, characterized in that the space whitening is effected by the forward filter (9) and the backward filter (12).
- 15 7. A device according to any preceding claim, characterized in that, starting from a certain iteration, the forward filter (9) is an adapted filter.
- 20 8. A system for high bit rate communication over frequency-selective channels with multiple transmit and receive antennas, characterized in that it includes a receiver that includes an equalization and decoding device according to any preceding claim.
- 25 9. A system according to claim 7, characterized in that it includes transmitter means of the ST-BICM type.
- 30 10. An iterative decoding and equalizing method for high bit rate communication over frequency-selective channels with multiple transmit and receive antennas, said device using a decision feedback equalizer adapted to receive data from different receiving antennas and including a forward filter (9) and a recursive backward filter (12) fed with calculated weighted reconstituted data from the output of a decoder (13) fed by decision means (11) and using means (10) for subtracting the output of said

backward filter (12) from the output data of the forward filter (9) whereby the subtracted data is fed to the input of the decision means (11) with the output of the decoder (13) and the decision means (11) produce a

5 statistic which is forwarded to a channel decoder with weighted inputs and outputs, and said decision means (11) take into account the space noise correlation at the output of the subtraction means (10) and the decision means (11) and the decoder (13) are separated by space-

10 time interleaving at a binary level, which method is characterized in that the forward filter (9) and the backward filter (12) are iteratively adapted to minimize the mean square error at the output of the subtractor (10).

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11. A method according to claim 10, characterized in that the recursive filtering of the decision feedback equalization is also adapted iteratively to minimize the mean square error at the input of the equalizer.

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12. A method according to claim 9 or claim 10, characterized in that the subtracted data is subjected to space whitening.

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13. A method according to any one of claims 9 to 11, characterized in that the decision algorithm (11) is of the sphere decoder type.

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14. A method according to claim 11 in combination with claim 12, characterized in that the space whitening is effected by the decision algorithm (11).

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15. A method according to any preceding claim, characterized in that, starting from a certain iteration, the forward filter (9) is an adapted filter.